

Micro-sensor system for 3D visualization of robotic medical procedures

Micro Sensors Are Expanding Surgical Capabilities for Military

Technology and Innovation

To expand the use of robotics in surgical procedures, physicians need to know where surgical instruments are located within the human body. Ascension's micro sensors meet this requirement by tracking the tip of flexible endoscopes, catheters, probes, and other instruments. 3D tracking enables instrument guidance, collision avoidance, system calibration, and improved procedural reliability.

Since the 1980s, medical researchers have explored using magnetic tracking devices to track the navigation of instruments, but the results have been disappointing. Sensor sizes were too large to attach to medical instruments, and nearby ferrous metal structures distorted the accuracy of the magnetic trackers. With DARPA funding, Ascension Technology Corporation focused on addressing those issues by:

- Miniaturizing magnetic field sensors from 5mm to 1.8 mm
- Developing a flat transmitter that can be placed beneath the patient to screen out metals—such as steel structures in operating room tables or rescue vehicles—and deliver a clear signal above its surface.

By combining these advances with Ascension's pulsed DC (direct current) magnetic technology, the company has produced a commercial medical system called *3D Guidance*. It simultaneously tracks up to eight low-cost, disposable

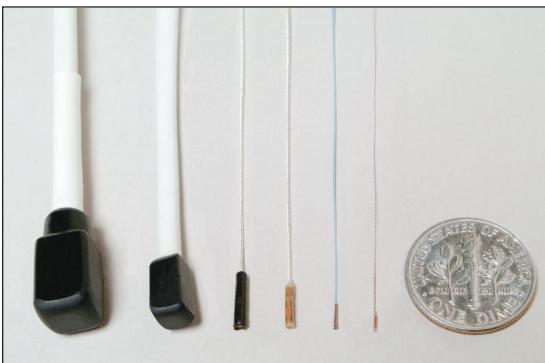


sensors, measures the position and orientation of each sensor in the patient, and generates data for 3D visualization.

3D Guidance is currently undergoing evaluation by numerous medical device manufacturers for incorporation into minimally invasive and image-guided products. Based on feedback from potential users, Ascension is also modifying the design to include smaller sensors and developing transmitter configurations for different medical procedural arrangements. The first medical system using the new technology will be released in the near future.

For military applications, DARPA supported the incorporation of 3D tracking technology into a larger robotics-based medical system that is being developed to triage and treat injured soldiers on the battlefield.

Ascension's micro sensors precisely localize and navigate medical instruments within a patient's body for image-guided procedures and visualization



With DARPA support, Ascension has miniaturized magnetic field sensors from 5mm to 1.8 mm to facilitate the tracking of instruments within the body. Even smaller systems are now available.

Joint Collaborations

Since the company was founded, Ascension has collaborated with leading researchers to develop and advance 3D tracking. The company's pulsed DC technology was initially developed in the late 1980s with funding from the U.S. Air Force. In the 1990s, the National Institutes of Health (NIH) funded the first level of sensor miniaturization. More recently, NIH funding has helped to improve the technology's accuracy and range of operation.

DARPA has also introduced Ascension to robotics companies developing innovative computer-assisted procedures.

Lessons Learned

- Identify and research DARPA program areas and requirements for new technology. This information will support targeted white paper and proposal development.
- Meet with DARPA program managers to discuss proposed concepts and gain valuable feedback on meeting DARPA's program requirements.
- Identify potential end-user applications that can drive development plans and lead to additional collaborations.

Economic Impact

DARPA SBIR has provided approximately 20% of the funding for development of Ascension's magnetic tracking technology. Along with other SBIR programs, it enabled Ascension to expand its technology into many military and medical configurations and enter the market for image-guidance of medical instruments.

Several medical companies have invested funds to configure 3D Guidance tracking devices to meet their unique procedural requirements.

About the Company

Ascension Technology Corporation, located in Milton, Vermont, makes 3D tracking devices for medical guidance, minimally invasive surgery, real-time visualization, and target acquisition. ■

Company Information

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Number of employees: 37